

Steel Design to Eurocode 3

Joints

Eurocode 3 Part: 1-8

Joint Types

CL 5.2.2.2 'Nominally pinned' joints are capable of transmitting internal forces without developing significant moments, and capable of accepting the resulting rotations under the design loads.

CL 5.2.2.3 'Rigid and full strength' joints have sufficient rotational stiffness to justify analysis based on full continuity.

'Semi-rigid' joints lie somewhere between 'nominally pinned' and 'rigid'.

Eurocode 3

- Principles mostly the same as BS 5950
- Results are similar although EC3 results are slightly more conservative and this is due to the larger partial safety factor ($\gamma_{M2}=1.25$)

Bolt Strength

These values should be adopted as characteristic values in design calculations :

Bolt classes	4.6	5.6	8.8	10.9
f_u (N/mm ²)	240	300	640	900
f_t (N/mm ²)	400	500	800	1000

EN 1993-1-8 Table 3.1 - Nominal values of f_u and f_t for bolts

Steel Strength

Steel grade	f_y (N/mm ²)				f_t (N/mm ²)	
	Nominal thickness of element t (mm)				Nominal thickness of element t (mm)	
	$t \leq 16$	$16 < t \leq 40$	$40 < t \leq 63$	$63 < t \leq 80$	$t < 3$	$3 \leq t \leq 100$
S 275	275	265	255	245	430 to 580	410 to 560
S 355	355	345	335	325	510 to 680	470 to 630

Extract from Table 7 of EN 10025-2

EN 1993-1-8 Clause 2.2

- Partial safety factors, γ_{M} for joints are given in Table 2.1 of EC 3-8.
- Refer to NA to get the required values of the different partial safety factors
- Resistance of bolts and welds, $\gamma_{M2} = 1.25$

Bolted Joints – Table 3.4

Table 3.4 of EN 1993-1-8 gives the different checks required for individual fasteners subjected to shear and/or tension.

Checks need to be carried out for a number of possible failure modes:

- Shear resistance per shear plane
- Bearing Resistance
- Tension Resistance
- Combined shear and tension

Bolted Joints – Tension

Tension resistance for ordinary bolts:

$$F_{t,Rd} = k_2 f_{ub} \frac{A_s}{\gamma_{M2}}$$

where:

- A_s is the tensile stress area of the bolt
- $\gamma_{M2} = 1.25$
- f_{ub} is the ultimate tensile strength of the bolt
- $k_2 = 0.63$ for countersunk bolt, otherwise $k_2 = 0.9$

Bolted Joints – Shear

Shear resistance per shear plane for ordinary bolts where the shear plane passes through the threaded portion of the bolt:

$$F_{v,Rd} = \alpha_v f_{vb} \frac{A_s}{\gamma_{M2}}$$

where:

- A_s is the tensile stress area of the bolt
- f_{vb} is the ultimate tensile strength of the bolt
- $\gamma_{M2} = 1.25$

Bolt classes	4.6	4.8	5.6	5.8	6.8	8.8	10.9
α_v	0.6	0.5	0.6	0.5	0.5	0.6	0.5

Eurocode 3 Part 8 Design Guide

A Loxley



Eurocode 3 Part 8 Design Guide:

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